

**U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: *Rana luteiventris*

COMMON NAME: Columbia spotted frog (Great Basin Distinct Population Segment (DPS))

LEAD REGION: CNO

INFORMATION CURRENT AS OF: November 1, 2005

STATUS/ACTION

☐ Species assessment - determined we do not have sufficient information on file to support a proposal to list the species and, therefore, it was not elevated to Candidate status

☐ New candidate

☒ Continuing candidate

☐ Non-petitioned

☒ Petitioned - Date petition received: 5-1-1989

☒ 90-day positive - FR date: 10-17-89 (USFWS 1989)

☐ 12-month warranted but precluded - FR date: 4-23-1993 (USFWS 1993)

☐ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? **YES**

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? **YES**

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. Higher priority actions.

The petition received in May 2004 to list all 225 candidate species, including the Great Basin DPS of *Rana luteiventris* as an endangered species under the Endangered Species Act was largely based on the present or threatened destruction, modification, or curtailment of its habitat or range, disease or predation, the inadequacy of existing regulatory mechanisms, and other natural or manmade factors affecting its continued existence (Center for Biological Diversity (CBD) *et al.* 2004). In addition, the petitioners state that these species have been on the candidate list for an average of 17 years and such delays have contributed to the extinction of many non-listed species (CBD *et al.* 2004). We considered the petition in this assessment; however, no new substantive information on this DPS was presented.

We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions (including candidate species with lower LPNs). During the past 12 months, almost our entire national listing budget has been consumed by work on various listing

actions to comply with court orders and court-approved settlement agreements, emergency listings, and essential litigation-related, administrative, and program management functions. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (<http://endangered.fws.gov/>).

___ Listing priority change

Former LP: ___

New LP: ___

Date when the species first became a Candidate (as currently defined): 4-23-1993

___ Candidate removal: Former LPN: ___

___ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

___ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

___ F – Range is no longer a U.S. territory.

___ I – Insufficient information exists on biological vulnerability and threats to support listing.

___ M – Taxon mistakenly included in past notice of review.

___ N – Taxon does not meet the Act's definition of "species."

___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Amphibians, Ranidae (Frogs)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Nevada, Oregon, Idaho.

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Nevada (Elko, Eureka, and Nye Counties), Oregon (Union, Baker, Wallowa, Umatilla, Grant and Malheur Counties), Idaho (Twin Falls, Minidoka and Owyhee Counties).

LAND OWNERSHIP: An estimated 90 percent of all known habitat for the Great Basin DPS of the Columbia spotted frog occurs on lands managed by the Forest Service and the BLM. The remainder of known or suspected sites occur on private, Tribal, or State lands.

LEAD REGION CONTACT: Debbie Pierce (CNO) 916-414-6464

LEAD FIELD OFFICE CONTACT: Nevada Fish and Wildlife Office (Reno), Chad Mellison or David Potter, 775-861-6300.

BIOLOGICAL INFORMATION

Species Description

Ranids typically are characterized as slim-waisted, long-legged, smooth-skinned jumpers with webbed hind feet and usually with a pair of dorsolateral folds (glandular folds) that extend from behind the eyes to the lower back. Adult Columbia spotted frogs in Nevada measure approximately 5.6 centimeters (2.2 inches) from snout to vent, with females being larger than males. Dorsal color and pattern include a light brown, dark brown, or gray, with small spots. Ventral coloration can differ among geographic population units and may range from yellow to salmon, however, very young individuals may have very pale, almost white, ventral surfaces. The throat and the ventral region are sometimes mottled. The head may have a dark mask with a light stripe on the upper jaw and the eyes are turned slightly upward. Male frogs have swollen thumbs with darkened bases.

Columbia spotted frogs are similar to, and often are mistaken for, leopard frogs. Specific characteristics that distinguish the Columbia spotted frogs from the leopard frog include: rough skin, shorter limbs (the heel of the hind limb when adpressed seldom reaches the nostrils), larger webs between the toes, smaller tympanum, and the smooth round eyes which are turned slightly upward. Distinguishing characteristics of the leopard frog are very large conspicuous spots and a mostly white ventral surface compared to the pigmented ventral surfaces of adult Columbia spotted frogs (Stebbins 1985).

Taxonomy: The Service recognizes species-specific genetic and geographic differences in Columbia spotted frogs based on Green (1991), Green *et al.* (1996, 1997), and Bos and Sites (2001). Based on further geographic and genetic characterization, Columbia spotted frogs in Idaho, eastern Oregon, and Nevada are part of the Great Basin population of Columbia spotted frogs. Through morphometric and allozyme data (Green *et al.* 1996, 1997), a small population on the eastern border of White Pine County, Nevada and Toole County, Utah, has been determined to be part of the West Desert population of Columbia spotted frogs.

Habitat: Columbia spotted frogs are found closely associated with clear, slow-moving or ponded surface waters, with little shade (Reaser 1997). Reproducing populations have been found in habitats characterized by springs, floating vegetation, and larger bodies of pooled water (e.g., oxbows, lakes, stock ponds, beaver-created ponds, seeps in wet meadows, backwaters) (Idaho Department of Fish and Game (IDFG) *et al.* 1995; Reaser 1997). A deep silt or muck substrate may be required for hibernation and torpor (Morris and Tanner 1969). In colder portions of their range, Columbia spotted frogs will use areas where water does not freeze, such as spring heads and undercut streambanks with overhanging vegetation (IDFG *et al.* 1995). Females may lay only one egg mass per year; yearly fluctuations in the sizes of egg masses are extreme (Utah Division of Wildlife Resources 1998). Successful egg production and the viability and metamorphosis of Columbia spotted frogs are susceptible to habitat variables such as temperature, depth, and pH of water, cover, and the presence/absence of predators (e.g., fishes and bullfrogs) (Morris and Tanner 1969; Munger *et al.* 1996; Reaser 1996b).

Current and Historical Range/Distribution: The current and historical range of the Great Basin DPS of the Columbia spotted frog includes portions of Nevada, Idaho, and Oregon. Specific

information for these areas follows.

Distribution in Nevada

Columbia spotted frogs in Nevada are found in the central (Nye County) and northeastern (Elko and Eureka Counties) parts of the state, usually at elevations between 1,700 and 2,650 meters (5,600 and 8,700 feet), although they have been recorded historically in a broader range including Lander County in central Nevada and Humboldt County in northwest Nevada (Reaser 2000). The Great Basin DPS of Columbia spotted frogs in Nevada is geographically separated into three distinct subpopulations; the Jarbidge-Independence Range, Ruby Mountains, and Toiyabe Mountains subpopulations.

The largest of Nevada's three subpopulation areas is the Jarbidge-Independence Range in Elko and Eureka Counties. This subpopulation area is formed by the headwaters of streams in two major hydrographic basins. The South Fork Owyhee, Owyhee, Bruneau, and Salmon Falls drainages flow north into the Snake River basin. Mary's River, North Fork of the Humboldt, and Maggie Creek drain into the interior Humboldt River basin. The Jarbidge-Independence Range subpopulation is considered to be genetically and geographically most closely associated with Columbia spotted frogs in southern Idaho (Reaser 1997).

Columbia spotted frogs occur in the Ruby Mountains in the areas of Green Mountain, Smith, and Rattlesnake creeks on lands in Elko County managed by the U.S. Forest Service (Forest Service). Columbia spotted frogs located in the Ruby Mountains are geographically close to the Jarbidge-Independence Range populations, however, preliminary allozyme evidence suggests they are genotypically different (J. Reaser, consultant, pers. comm., 1998). The Ruby Mountains population is considered discrete because of this difference (J. Reaser, consultant, pers. comm., 1998) and because it is geographically isolated from the Jarbidge-Independence Range population area to the north by an undetermined barrier (e.g., lack of suitable habitat, connectivity, and/or predators), and from the Toiyabe Mountains subpopulation area to the southwest by a large gap in suitable Humboldt River drainage habitat.

In the Toiyabe Range, Columbia spotted frogs are found in seven drainages in Nye County, Nevada--the Reese River (Upper and Lower), Cow and Ledbetter Canyons, and Cloverdale, Stewart, Illinois, and Indian Valley Creeks. Although historically they also occurred in Lander County, preliminary surveys have found them absent from this area (J. Tull, Forest Service, Ely Ranger District, pers. comm., 1998). The Toiyabe Mountains subpopulation is geographically isolated from the Ruby Mountains and Jarbidge-Independence Range subpopulations by a large gap in suitable habitat and they represent *Rana luteiventris* in the southern-most extremity of its range. Genetic analyses of spotted frogs from the Toiyabe Range suggest that these frogs are distinctive in comparison to frogs from the Ruby Mountains and Jarbidge-Independence Range subpopulation areas (Green *et al.* 1996, 1997; J. Reaser, consultant, pers. comm., 1998). Genetic (mtDNA) differences between the Toiyabe Range frogs and the Ruby Mountains frogs are less than those between the Toiyabe Range frogs and the Jarbidge-Independence Range frogs, but this may be because of similar temporal and spatial isolation (J. Reaser, consultant, pers. comm., 1998).

Distribution- Idaho and Oregon

Historically, the range of the Columbia spotted frog in Idaho included the Raft River and Goose Creek drainages in Minidoka County and the Owyhee Mountains in Owyhee County in southern Idaho. In eastern Oregon, the historic range of Columbia spotted frogs included the Blue and Wallowa Mountains in Wallowa County and the Owyhee Mountains in Malheur County. Surveys conducted in the Raft River and Goose Creek drainages in Idaho failed to relocate Columbia spotted frogs (Reaser 1997; Shipman and Anderson 1997; Turner 1962). In 1994 and 1995, the Bureau of Land Management (BLM) conducted surveys in the Jarbidge and Snake River Resource Areas in Twin Falls County, Idaho. These efforts were also unsuccessful in locating Columbia spotted frogs (McDonald 1996). Only 6 historical sites were known in the Owyhee Mountain range in Idaho, and only 11 sites were known in southeastern Oregon in Malheur County prior to 1995 (Munger et al. 1996).

Currently, Columbia spotted frogs appear to be widely distributed throughout southwestern Idaho (mainly in Owyhee County) and eastern Oregon and populations within this general area appear to be isolated from each other by either natural or human induced habitat disruptions. Based on the best available information, there are 49 known local populations in southern Idaho (Engle 2000; Idaho Conservation Data Center (ICDC) 2000) and 16 sites known to be occupied in eastern Oregon.

Population Estimates/Status

Status-Nevada- Declines of Columbia spotted frog populations in Nevada have been recorded since 1962, when it was observed that in many Elko County localities where it was once numerous, the species was nearly extirpated (Turner 1962). Extensive loss of habitat was found to have occurred from conversion of wetland habitats to irrigated pasture and spring and stream de-watering by mining and irrigation practices. In addition, there was evidence of extensive impacts on riparian habitats due to intensive livestock grazing. Recent work by researchers in Nevada have documented the loss of historically known sites, reduced numbers of individuals within local populations, and declines in the reproduction of those individuals (Hovingh 1990; Reaser 1996a, 1996b, 1997). Surveys in Nevada between 1994 and 1996 indicated that 54 percent of surveyed sites known to have Columbia spotted frogs before 1993 no longer supported individuals (Reaser 1997).

Little historical data are available for the largest subpopulation area in Nevada, the Jarbidge-Independence Range. Prior to 1992, presence/absence surveys had been conducted by Stanford University, University of Nevada, Reno, and Brigham Young University researchers, and the Forest Service, but dependable information on numbers of breeding adults and trends is unavailable. Between 1993 and 1998, 976 sites were surveyed for the presence of Columbia spotted frogs in northeastern Nevada, including the Ruby Mountains subpopulation area (Shipman and Anderson 1997; Reaser 2000). Of these, 746 sites (76 percent) that were believed to have characteristics suitable for frogs were unoccupied, and 230 (24 percent) were occupied. For these particular sites there is no information on historical presence of Columbia spotted frogs. Of 212 sites known to have been previously occupied, 107 (50 percent) no longer had

frogs, while 105 sites did support frogs. At the occupied sites, surveyors observed more than 10 adults at only 13 sites (12 percent). Frogs in the the Jarbidge-Independence Range appeared widely distributed (Reaser 1997).

Between 1998 and 2001, no monitoring or surveying took place in northeastern Nevada. The Forest Service resumed amphibian surveys in the summer of 2002. During that field season, crews went back to previously surveyed sites that were identified during the 1993 – 1998 surveys (W. Amy, Forest Service, Ruby Mountain Ranger District, pers. comm., 2003). Of the 168 sites visited, Columbia spotted frogs were present at 58 sites (34 percent). Columbia spotted frogs were not detected at the remaining 110 sites (66 percent). In 2003, the Forest Service surveyed an additional 161 sites and found 19 occupied (10 percent). During this period, the Nevada Department of Wildlife (NDOW) also conducted presence/absence surveys on 29 historic sites on BLM and Forest Service lands. Frogs were found at 8 of these 29 sites (28 percent) with tadpoles, juveniles, and adults being present. In 2004, Forest Service crews conducted visual encounter surveys at 123 locations corresponding to historic sites among 51 streams/springs. Columbia spotted frogs were present at 46 locations (Meneks 2005).

During 2004, the Forest Service also conducted mark/recapture surveys at two sites as part of an effort to determine population estimates, mortality, juvenile-to-adult recruitment, movement, and habitat preference. A total of 123 frogs were captured, 62 of which were marked using Passive Integrated Transponder or PIT tags (Meneks 2005). Data collection and analysis for this effort is ongoing. Additionally, presence/absence surveys were conducted by the Service and Tribal members for the first time on the Nevada portion of the Duck Valley Tribal lands during 2004 and 2005, where the species was found in 7 out of 16 locations surveyed.

Between 1993 and 1998, 339 sites were surveyed for the presence of Columbia spotted frogs in the Toiyabe Range. Surveyors visited 118 sites (35 percent) with suitable habitat characteristics where no frogs were present. Ten historic frog sites no longer had frogs when surveyed by Reaser between 1993 and 1996 (Reaser 1997). At 211 other historic sites, frogs were still present during this survey period. Of these 211 sites, surveyors reported greater than 10 adult frogs at 133 sites (63 percent) (Reaser 1997). During the summers of 2000 and 2001, mark-recapture surveys of the Toiyabe Range subpopulation were conducted by the University of Nevada, Reno. Preliminary estimates of frog numbers in the Indian Valley Creek drainage were around 5,000 breeding individuals, which is greater than previously believed (Hatch, et al. 2002). However, during the 2000-2001 winter, Hatch et al. (2002) noted a large population decrease, ranging between 66 and 86.5 percent at several sites. Preliminary results suggest anoxia as the cause of death; however, more research is being proposed to help understand this apparent winterkill (Hatch et al. 2002). During the summer of 2002, amphibian surveys were conducted by Brigham Young University. Sites from the 1998 survey effort were revisited. Of the 33 sites which contained frogs in 1998, Columbia spotted frogs were still present in 22 sites (67 percent). Columbia spotted frogs were not detected at the remaining 11 sites (33 percent) (Hatch, et al. 2002). Because of the continued drought and lack of suitable habitat, the 2003 survey resulted in no frogs being present in many locations, while populations at permanent water sites continue to decline.

The lack of standardized or extensive monitoring and routine surveying has prevented dependable determinations of frog population numbers or trends in Nevada. However, due to the signing of a conservation agreement and strategy (CAS) in 2003 (Nevada Department of Wildlife 2003a, b), standardized protocols and consistent monitoring is taking place in both the Northeast and Toiyabe subpopulations. A large mark-recapture study using pit tags was initiated for the Toiyabe subpopulation in 2004 and continued in 2005. A habitat enhancement project was completed in the fall of 2004 which included the construction or augmentation of 22 ponds. (Nevada Department of Wildlife 2004).

Status- Idaho and Oregon- Extensive surveys since 1996 throughout southern Idaho and eastern Oregon, have led to increases in the number of known spotted frog sites. Although efforts to survey for Columbia spotted frogs have increased the available information regarding known species locations, most of these data suggest the sites support small numbers of frogs. Of the 49 known local populations in southern Idaho, 61 percent had 10 or fewer adult frogs and 37 percent had 100 or fewer adult frogs (Engle 2000; Idaho Conservation Data Center (ICDC) 2000). The largest known local population of Columbia spotted frogs occurs in the Rock Creek drainage of Owyhee County and supports under 250 adult frogs (Engle 2000). Extensive monitoring since 1997 at 10 of the 46 occupied sites indicates a general decline in the number of adult Columbia spotted frogs encountered (Engle 2000; Engle and Munger 2000; Engle 2002a). All known local populations in southern Idaho appear to be functionally isolated (Engle 2000; Engle and Munger 2000). Boise State University continues doing research including the reintroduction of beaver for spotted frog restoration (Munger and Lingo 2003), spotted frog habitat evaluations (Munger 2003), and sentinel site surveys (Lingo and Munger 2003). Results from the 2004 survey indicate lower recruitment in 3 of the 4 sentinel sites including no recruitment at two of the sites, however, adults have increased at two of the four sites. Additionally, the overall population at one site, Stoneman Creek, has increased partially due to habitat improvements (Blankinship and Munger 2005).

Of the 16 sites that are known to support Columbia spotted frogs in eastern Oregon, 81 percent of these sites appear to support fewer than 10 adult Columbia spotted frogs. In southeastern Oregon, surveys conducted in 1997 found a single population of Columbia spotted frogs in the Dry Creek drainage of Malheur County. Population estimates for this site in 1996 were under 300 adult frogs (Munger *et al.* 1996). Detailed population estimates using pit tags have occurred in Dry Creek since 2001, with results from one test section indicating a small but stable population of 11 adults at the site from 2000-2003, followed by an increase to 36 adults in 2004 which was attributed to a better water year at that particular site (Engle 2004). Monitoring of Columbia spotted frogs in northeastern Oregon in Wallowa County since 1998 indicates relatively stable, small local populations (fewer than five adults encountered per local population) (Pearl 2000); however, Bull (2005) reports a healthy metapopulation among six populations in northeastern Oregon. All of the known local populations of Columbia spotted frogs in southeastern Oregon appear to be functionally isolated.

Between 2000 and 2003, the United States Geological Survey (USGS) conducted a 3-year study to compare current regional distributions of amphibians with occurrence patterns suggested in

historical data (Adams 2004). Visual encounter surveys were used to determine current presence/absence of Columbia spotted frogs on public lands in eastern Oregon and northern Nevada. Based on occupancy models, USGS estimated that Columbia spotted frogs occupied 16 (53 percent) of its 30 historical sites in the area studied (Adams 2004). Six of sixteen potential sites were occupied between 200 and 2003. Additionally, 187 sites were randomly selected for presence/absence surveys of which only 3 sites were occupied. Variability in occupancy between the 3 years, however, was problematic.

2004 marked the third year of two studies USGS initiated regarding the effects of roads and culverts on a population of Columbia spotted frogs in southeastern Oregon and the effects of grazing on populations of Columbia spotted frogs in the Wallowa Mountains of northeastern Oregon (Adams 2004).

DISTINCT POPULATION SEGMENT (DPS)

Under the Act, we must consider for listing any species, subspecies, or, for vertebrates, DPSs of these taxa, if information is sufficient to indicate that such action may be warranted. To implement the measures prescribed by the Act and its Congressional guidance, we, along with the National Oceanic and Atmospheric Administration (NOAA) Fisheries, developed policy to clarify our interpretation of the phrase “distinct population segment of any species of vertebrate fish or wildlife” for the purposes of listing, delisting, and reclassifying species under the Act (61 FR 4722; February 7, 1996). The policy allowed us to interpret the requirement of the Act to “... determine whether any species is an endangered species or a threatened species” (section 4(a)(1)) in a clear and consistent fashion for the term “distinct population segment.” Under our DPS policy, we consider three elements in a decision regarding the status of a possible DPS as endangered or threatened under the Act. These are applied similarly for addition to the lists of endangered and threatened wildlife and plants, for reclassification, and for removal. The elements are: (1) the population segment’s discreteness from the remainder of the species to which it belongs; (2) the population segment’s significance to the species to which it belongs; and (3) the population segment’s conservation status in relation to the Act’s standards for listing (i.e., when treated as if it were a species, is the population segment endangered or threatened?). Our policy further recognizes it may be appropriate to assign different classifications to different DPSs of the same vertebrate taxon (61 FR 4722).

Discreteness

The DPS policy’s standard for discreteness allows an entity given DPS status under the Act to be adequately defined and described in some way that distinguishes it from other representatives of its species. A population segment of a vertebrate species may be considered discrete if it satisfies either one of the following two conditions: (1) it is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors (quantitative measures of genetic or morphological discontinuity may provide evidence of this separation); or (2) it is delimited by international governmental boundaries within which significant differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist.

Columbia spotted frogs in the Nevada, southwestern Idaho and southeastern Oregon portion of the Great Basin are geographically separate from the remainder of the species. Within this portion of the range, there are four subpopulations. The largest of Nevada's three subpopulation areas is the Jarbidge-Independence Range in Elko and Eureka Counties. This subpopulation area is formed by the headwaters of streams in two major hydrographic basins. The South Fork Owyhee, Owyhee, Bruneau, and Salmon Falls drainages flow north into the Snake River basin. Mary's River, North Fork of the Humboldt, and Maggie Creek drain into the interior Humboldt River basin. A smaller subpopulation of Columbia spotted frogs located in the Ruby Mountains about 50 miles south of the Jarbidge-Independence Range subpopulation, are isolated by lack of suitable habitat and hydrologic connectivity. The Toiyabe Mountains subpopulation is isolated nearly 200 miles southeast of the Ruby Mountains and Jarbidge-Independence Range subpopulations and they represent Columbia spotted frogs in the southernmost extremity of its range. The Owyhee subpopulation of Columbia spotted frogs appear to be widely distributed throughout southwestern Idaho (mainly in Owyhee County) and southeastern Oregon (Malheur County), but local populations within this general area are small and appear to be isolated from each other and from populations in Northeastern Nevada by either natural or human induced habitat disruptions.

All of these Great Basin subpopulations are geographically isolated and separate from the main continuous population of Columbia spotted frogs in the central mountains of Idaho and northeastern Oregon by the Snake River Plain and adjacent lowlands in eastern Oregon. The Owyhee subpopulation is approximately 100 miles from the main continuous population in central Idaho. Occupied habitat in the main continuous population is characterized by conifer forests and high elevation lake environments while habitat for the Great Basin population is characterized by Great Basin vegetation dominated by sagebrush with stream and pond environments. Furthermore, the Great Basin population is both hydrologically and geographically separated from isolated populations in Utah. The subpopulation in the Ruby Mountains (Lahontan Basin) is approximately 90 miles away from the West Desert population (Bonneville Basin) near Ibapah, Utah. As detailed below, the finding of geographic isolation is supported by genetic analyses.

The strongest genetic evidence that the Great Basin frogs are genetically discrete from other Columbia spotted frogs comes from Bos and Sites (2001) who examined mitochondrial DNA (mtDNA) sequence variation. These data indicate that the frogs sampled in Nevada do not share mtDNA haplotypes (DNA sequences) with the remainder of the frogs sampled. Frogs sampled in Nevada all clustered together on phylogenetic trees (which indicate relationships among populations or groups) which were constructed using two different methods (maximum parsimony and maximum likelihood, Avise 1994, Weir 1996). The Nevada branch of the phylogenetic tree is strongly supported statistically (with bootstrap probability of 100 percent). Bootstrapping is a method of statistically testing the significance of particular patterns; it involves resampling (with replacement) from the existing data sets and then reassessing the frequency with which particular groups appear in trees generated from the resampled data (Avise 1994, Weir 1996). This means that 100 percent of the phylogenetic trees generated from the resampled data had the same configuration. A bootstrap probability of seventy percent is the

normal criterion for statistical significance in the systematic literature (Hillis and Bull 1993). This indicates the sampled Nevada frogs are very distinct relative to Columbia spotted frogs sampled from other portions of the range.

Genetic samples were not collected from southern Idaho and southeastern Oregon. Because these areas were not sampled in the study, we do not know whether or not these areas would cluster with the Nevada group indicated by mtDNA. An earlier allozyme study did include samples from one site in southwestern Idaho. In this study, samples from Nevada and southwestern Idaho were related to samples from Anthony Lake, Oregon (Green et al. 1996, 1997). Although differences between these samples and others throughout the range were not as striking as the differences indicated by the mtDNA study of Bos and Sites (2001) (i.e., they were primarily differences in frequency of alleles (types) present versus differences in *which* alleles were present), they suggest that there is some genetic similarity of frogs in southwestern Idaho with those in Nevada. Based on the available information on genetics and historic distribution, we have considered the populations in southern Idaho and southeastern Oregon to be part of the Great Basin population.

Significance

Under our DPS policy, once we have determined that a population segment is discrete, we consider its biological and ecological significance to the larger taxon to which it belongs. This consideration may include, but is not limited to, evidence of the persistence of the discrete population segment in an ecological setting that is unique for the taxon; evidence that loss of the population segment would result in a significant gap in the range of the taxon; evidence that the population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; and evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

We have found substantial evidence that two of these significance factors are met by the Great Basin population of the Columbia spotted frog. The extinction of the Nevada, southwestern Idaho and southeastern Oregon portion of the Columbia spotted frog would likely result in the loss of a significant genetic entity and the curtailment of the range of the species. Particularly, the work of Bos and Sites (2001) indicates that Columbia spotted frogs in Nevada differ from Columbia spotted frogs sampled in other portions of the range to a significant degree (i.e., they are very distinct genetically). Additionally, loss of Columbia spotted frogs in Nevada, southwestern Idaho and southeastern Oregon would eliminate the southern extent of the species range.

Conclusion

We evaluated the Great Basin population of Columbia spotted frogs, addressing the two elements which our policy requires us to consider in deciding whether a vertebrate population may be recognized as a DPS and considered for listing under the Act. We conclude that the Great Basin population is discrete, as per our policy, based on its geographic separation and

genetic divergence from the isolated populations in Utah and the main continuous populations in central and northern Idaho, northeastern Oregon, eastern Washington, western Montana, northwestern Wyoming, southeast Alaska, and British Columbia and Alberta, Canada. We conclude that the Great Basin population of the Columbia spotted frog is significant because the loss of the species from these populations would result in a significant reduction in the species' range and would constitute loss of a genetically divergent portion of the species. Because the population segment meets the discreteness and significance criteria of our DPS policy, the Great Basin populations of the Columbia spotted frog constitutes a DPS which qualifies for consideration for listing.

THREATS

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

Columbia spotted frog habitat degradation and fragmentation is probably a combined result of past and current influences of heavy livestock grazing, spring development, agricultural development, urbanization, and mining activities. These activities eliminate vegetation necessary to protect frogs from predators and UV-B radiation (Kiesecker and Blaustein 1995; Blaustein *et al.* 1997); reduce soil moisture; create undesirable changes in water temperature, chemistry and water availability; and can cause restructuring of habitat zones through trampling, downcutting, or degradation which in turn can negatively affect the available invertebrate food source (IDFG *et al.* 1995; Munger *et al.* 1997; Reaser 1997; Engle and Munger 2000; Engle 2002a). Columbia spotted frog habitat occurs in the same areas where these activities are likely to take place, or where these activities occurred in the past and resulting habitat degradation has not improved over time. Natural fluctuations in environmental conditions tend to magnify the detrimental effects of these activities, just as the activities may also magnify the detrimental effects of natural environmental events.

Springs provide a stable, permanent source of water for frog breeding, feeding, and winter refugia (IDFG *et al.* 1995). Springs provide deep, protected areas which serve as hibernacula for Columbia spotted frogs in cold climates. Springs also provide protection from predation through underground openings (IDFG *et al.* 1995; Patla and Peterson 1996). Most spring developments result in the installation of a pipe or box to fully capture the water source and direct water to another location such as a livestock watering trough. Loss of this permanent source of water in desert ecosystems can also lead to the loss of associated riparian habitats and wetlands used by Columbia spotted frogs. Developed spring pools could be functioning as attractive nuisances for frogs, concentrating them into isolated groups, increasing the risk of disease and predation (Engle 2001). Many of the springs in southern Idaho, eastern Oregon, and Nevada have been developed.

The reduction of beaver populations has been noted as an important feature in the reduction of suitable habitat for Columbia spotted frogs. Beaver are important in the creation of small pools with slow-moving water that function as habitat for frog reproduction and create wet meadows that provide foraging habitat and protective vegetation cover, especially in the dry interior western United States (St. John 1994). Beaver trapping is still common in Idaho and harvest is unregulated in most areas (IDFG *et al.* 1995). In some areas, beavers are removed because of a

perceived threat to water for agriculture or horticultural plantings. As indicated above, permanent ponded waters are important in maintaining spotted frog habitats during severe drought or winter periods. Removal of a beaver dam in Stoneman Creek in Idaho is believed to be directly related to the decline of a spotted frog subpopulation there. Intensive surveying of the historical site where Columbia spotted frogs were known to have occurred has documented only one adult spotted frog (Engle 2000). In 2001, a beaver reintroduction project was started on Stoneman Creek and by 2002 the site had one of the highest recruitment classes of Columbia spotted frogs in the Owyhee subpopulation (Lingo and Munger 2003).

Fragmentation of habitat may be one of the most significant barriers to Columbia spotted frog recovery and population persistence (Semlitsch 2002; Funk et al. 2005a). Recent studies in Idaho indicate that Columbia spotted frogs exhibit breeding site fidelity (Patla and Peterson 1996; Engle 2000; Engle and Munger 2000; J. Engle, IDFG, pers. comm., 2001). Movement of frogs from hibernation ponds to breeding ponds may be impeded by zones of unsuitable habitat (Funk et al. 2005b). As movement corridors become more fragmented through loss of flows within riparian or meadow habitats, local populations will become more isolated (Engle 2000; Engle 2001). Vegetation and surface water along movement corridors provide relief from high temperatures and arid environmental conditions, as well as protection from predators. Loss of vegetation and/or lowering of the water table as a result of the above mentioned activities can pose a significant threat to frogs moving from one area to another. Likewise, fragmentation and loss of habitat can prevent frogs from colonizing suitable sites elsewhere (Gibbs 2000; Snodgrass et al. 2000; Semlitsch 2002; Funk et al. 2005b).

Although a direct relationship between Columbia spotted frog declines and livestock grazing has not been studied, the effects of heavy grazing on riparian areas are well documented (Kauffman et al. 1982; Kauffman and Kreuger 1984; Skovlin 1984; Kauffman et al. 1985; Schulz and Leininger 1990). Heavy grazing in riparian areas on state and private lands is a chronic problem throughout the Great Basin. In the fall of 2000, 250 head of cattle were allowed to graze for 45 days on one pasture in the Indian Valley Creek drainage of the Humboldt-Toiyabe National Forest in central Nevada for the first time in 6 years (M. Croxen, Forest Service, Tonopah Ranger District, pers. comm., 2002). Grazing was not allowed in this allotment in 2001, however, grazing resumed in 2002. Recent mark-recapture data indicated that this drainage supports more frogs than previously presumed, potentially around 5,000 individuals (K. Hatch, pers. comm., 2000). Perceived improvements in the status of frog populations in the Indian Valley Creek area may be a result of past removal of livestock grazing. The reintroduction of grazing disturbance into this relatively dense area of frogs has yet to be determined. During a site visit to the Toiyabe subpopulation in November 2003, trespass grazing had occurred in the Indian Valley Creek drainage.

In the Toiyabe Range, the Bureau of Land Management fenced 3.2 kilometers (km) (2 mi) of damaged riparian area along Cloverdale Creek (to protect it from grazing) during the summer of 2002. In addition to the riparian exclosure, BLM biologists located a diversion dam in 1998 on Cloverdale Creek which was completely de-watering approximately 1.6 km (1 mi) of stream. During the summer of 2000, this area was reclaimed and water was put back into the stream. This area of the stream is not currently occupied by Columbia spotted frogs but it is historic

habitat.

Livestock grazing continues to impact riparian areas in the Northeast subpopulation in Nevada. The Forest Service has completed three riparian area protection projects in areas where Columbia spotted frogs occur. These projects include altering stocking rates or changing the grazing season in two allotments known to have Columbia spotted frogs and constructing riparian fencing on one allotment. However, the Forest Service has not monitored these three sites to determine whether efforts to protect riparian habitat and Columbia spotted frogs have been successful.

The effects of mining on Great Basin Columbia spotted frogs, specifically, have not been studied, but the adverse effects of mining activities on water quality and quantity, other wildlife species, and amphibians in particular have been addressed in professional scientific forums (Chang et al. 1974; Birge et al. 1975; Greenhouse 1976; Khangarot et al. 1985).

B. Overutilization for commercial, recreational, scientific, or educational purposes.

This is not known to be a threat to Great Basin Columbia spotted frogs at this time.

C. Disease or predation.

Predation by fishes is likely an important threat to Columbia spotted frogs. The introduction of nonnative salmonid and bass species for recreational fishing may have negatively affected frog species throughout the United States. The negative effects of predation of this kind are difficult to document, particularly in stream systems. However, significant negative effects of predation on frog populations in lentic systems have been documented (Hayes and Jennings 1986; Pilliod et al. 1996; Knapp and Matthews 2000; Pilliod and Peterson 2000; Pilliod and Peterson 2001; Knapp 2005). One historic site in southern Idaho no longer supports spotted frog although suitable habitat is available. This may be related to the presence of introduced bass in the Owyhee River (ICDC 2000). The stocking of nonnative fishes is common throughout waters of the Great Basin. The NDOW has committed to conducting stomach sampling of stocked nonnative and native species to determine the effects of predation on Columbia spotted frogs. To date, NDOW has not altered fish stocking rates or locations in order to benefit Columbia spotted frogs.

The bull frog (*Rana catesbeiana*), a nonnative ranid species, occurs within the range of the spotted frog in the Great Basin. Bullfrogs are known to prey on other frogs (Hayes and Jennings 1986). They are rarely found to co-occur with Columbia spotted frogs (one known site in Nevada), but whether this is the result of competitive exclusion, predation, or some other reason is unknown at this time.

Although a diversity of microbial species is naturally associated with amphibians, it is generally accepted that they are rarely pathogenic to amphibians except under stressful environmental conditions. Chytridiomycosis (chytrid) is an emerging panzootic fungal disease in the United States (Fellers et al. 2001; Rachowicz et al. 2005). Clinical signs of amphibian chytrid include

abnormal posture, lethargy, and loss of righting reflex. Gross lesions, which are usually not apparent, consist of abnormal epidermal sloughing and ulceration; hemorrhages in the skin, muscle, or eye; hyperemia of digital and ventrum skin, and congestion of viscera. Diagnosis is by identification of characteristic intracellular flask-shaped sporangia and septate thalli within the epidermis. Chytrid can be identified in some species of frogs by examining the oral discs of tadpoles which may be abnormally formed or lacking pigment (Fellers et al. 2001).

Chytrid was confirmed in the Circle Pond site, Idaho, where long term monitoring since 1998 has indicated a general decline in the population (Engle 2002a). It is unclear whether the presence of this disease will eventually result in the loss of this subpopulation. Two additional sites (including Dry Creek, Malheur County, Oregon) have also tested positive for chytrid (J. Engle, USFWS, pers. comm., 2004; Engle 2002b). Protocols to prevent further spread of the disease by researchers were instituted in 2001. Chytrid has also been found in the Wasatch Columbia spotted frog distinct population segment (K. Wilson, Utah Division of Wildlife Resources, pers. comm., 2002). Chytrid has not been found in Nevada populations of Columbia spotted frogs.

D. The inadequacy of existing regulatory mechanisms.

Spotted frog occurrence sites and potential habitats occur on both public and private lands. This species is included on the Forest Service sensitive species list; as such, its management must be considered during forest planning processes.

BLM policies direct management to consider candidate species on public lands under their jurisdiction. To date, BLM efforts to conserve Columbia spotted frogs and their habitat in Idaho, Oregon, and Nevada have not been adequate to address threats

The status of local populations of Columbia spotted frogs on Yomba-Shoshone or Duck Valley Tribal lands is unknown. Tribal governments do not have regulatory or protective mechanisms in place to protect Columbia spotted frogs.

NDOW classifies the spotted frog as a protected species, but they are not afforded official protection in Nevada. Though the spotted frog is on the sensitive species list for the State of Idaho, this species is not given any special protection by the State. Columbia spotted frogs are not on the sensitive species list for the State of Oregon. NatureServe (2005) classifies it as imperiled and vulnerable to extirpation and extinction in the Oregon.

Protection of wetland habitat from loss of water to irrigation or spring development is difficult because most water in the Great Basin has been allocated to water rights applicants based on historical use and spring development has already occurred within much of the known habitat of Columbia spotted frogs. Federal lands may have water rights that are approved for wildlife use, but these rights are often superseded by historic rights upstream or downstream that do not provide for minimum flows. Also, most public lands are managed for multiple use and are subject to livestock grazing, silvicultural activities, and recreation uses that may be incompatible with spotted frog conservation without adequate mitigation measures.

E. Other natural or manmade factors affecting its continued existence.

Drought conditions related to multiple consecutive years of less than average precipitation have resulted in a reduction in the number of suitable sites available to Columbia spotted frogs. Local extirpations eliminate source populations from habitats that in normal years are available as frog habitat (Lande and Barrowclough 1987; Schaffer 1987; Gotelli 1995). These climate events are likely to exacerbate the effects of other threats, thus increasing the possibility of stochastic extinction of subpopulations by reducing their size and connectedness to other subpopulations (see Factor A for additional information). As movement corridors become more fragmented, due to loss of flows within riparian or meadow habitats, local populations will become more isolated (Engle 2000). Increased fragmentation of the habitat can lead to greater loss of populations due to demographic and/or environmental stochasticity (Pilliod *et al.* 2003).

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

A conservation agreement and strategy was signed in September 2003 (Nevada Department of Wildlife 2003a, b) for both the Northeast and the Toiyabe subpopulations in Nevada. Additionally, a Candidate Conservation Agreement with Assurances is near completion for the Owyhee subpopulation at Sam Noble Springs, Idaho. Active monitoring, research, and habitat improvement projects are occurring or are being planned throughout the range of the Great Basin DPS of Columbia spotted frogs.

SUMMARY OF THREATS

As described above, the Great Basin DPS of the Columbia spotted frog is threatened by the present or threatened destruction, modification, or curtailment of its habitat or range habitat. This includes impacts of water developments and, although a direct relationship between Columbia spotted frog declines and livestock grazing has not been studied, there is good reason to conclude that livestock grazing is impacting habitat of the species. The reduction of beaver populations has contributed to the reduction of suitable habitat. Emerging fungal diseases such as chytridiomycosis and nonnative predators such as trout are contributing factors to Columbia spotted frog population declines throughout its range (factor C). The existing regulatory mechanisms (factor D) appear to be inadequate in that the status of the DPS does not appear to be improving and the threats are continuing. Climate change such as drought (which has impacted habitat in recent years) and stochastic events such as fire often have detrimental effects to small isolated populations and can exacerbate existing threats (factor E).

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority

High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3*
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude:

Threats to the species habitat occur rangewide, with populations that are isolated and fragmented. Disease has been found in some populations, and inadequate regulatory mechanisms are in place to protect this species throughout its range. In addition, drought has contributed to further loss of habitat and fragmentation.

Imminence:

Threats to the species habitat have occurred for over 100 years and continue to threaten the species today. Drought conditions from 2000-2004 have further fragmented and isolated frog populations in the Great Basin which has decreased suitable habitat. Chytrid fungus is documented in the Owyhee subpopulation which continues to cause declines in that subpopulation. To this date, numerous monitoring efforts are occurring throughout the range of the DPS. Conservation measures are beginning to be implemented as outlined through the Conservation Agreements and Strategies and a draft Candidate Conservation Agreement with Assurances but as yet, have not sufficiently reduced or removed the threats to this frog.

Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed? yes

Is Emergency Listing Warranted? No. The two conservation agreements and strategies and the development of candidate conservation agreements with assurances should provide a roadmap toward recovery. Monitoring the effectiveness of these agreements and willingness of the participants will continue to be a priority.

DESCRIPTION OF MONITORING

Numerous mark-recapture and presence-absence surveys are occurring throughout the range of the Great Basin DPS of Columbia spotted frogs. Monitoring and/or research is being conducted

by Brigham Young University and Boise State University, U.S. Geological Survey, Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service, Idaho Department of Fish and Game, NDOW, and the Nevada Natural Heritage Program. Annual reports and research papers are obtained by the Nevada Fish and Wildlife Office and summarized for the Candidate Notice of Review. Additionally, a rangewide Columbia spotted frog meeting (initiated in 2002) is held every two years to discuss various research, monitoring, and conservation occurring throughout the entire range of the species. The next meeting is being held in the spring of 2006 in Salt Lake City, Utah. Substantial effort is needed to conserve this species because it is a wide ranging species and occupies diverse habitat. These attributes also include numerous threats to the species and its habitat which are occurring throughout its range. Like most aquatic species, populations fluctuate yearly due to weather. It is important to track population changes annually and for significant time periods to distinguish between anthropogenic effects to the species and its habitat and natural population fluctuations due to climate.

COORDINATION WITH STATES

Various federal, state, local agencies and Universities from all three States provided information.

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: /s/ Paul Henson April 26, 2006
Acting CNO Manager, Fish and Wildlife Service Date



Concur: August 23, 2006
Acting Director, Fish and Wildlife Service Date

Do not concur:
Director, Fish and Wildlife Service Date

Date of annual review:
Conducted by: